

Replacement of Plasma Arc Torch with Water Jet Cutter Technology



The Oak Ridge National Laboratory's Fabrication Division (Facilities and Operations Directorate) has implemented a water jet cutter in Building 7012. This system provides a much safer, cleaner, efficient, and versatile one-step process for machining metal and only generates a miniscule amount of metal fines with the garnet. In contrast, the multi-step process that it replaced used a plasma arc torch welder, which required additional machining and was extremely loud presenting a noise hazard. The plasma arc welder generated a significant amount of waste metal that had to be cleaned up and recycled, and the process also required an air permit.

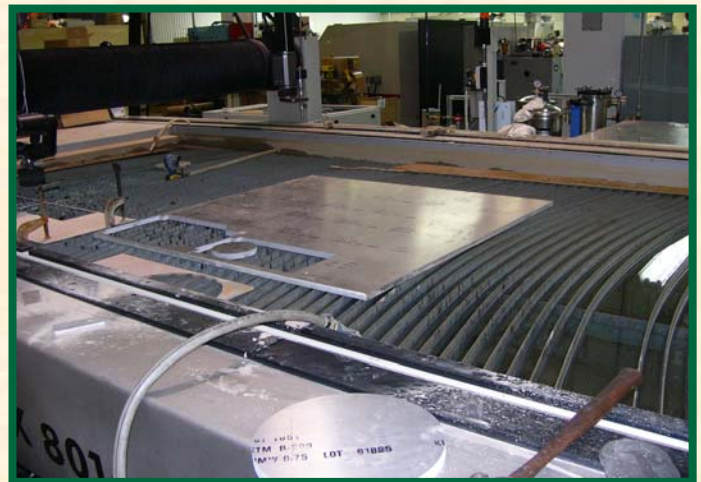


Plasma Arc Torch Welder

Consequently, this source reduction initiative:

- improved safety - hearing protection and elimination of the release of airborne contaminants and associated air permit (particulates and NO_x)
- improved operational efficiency, versatility and expanded capabilities
- reduced the amount of metal used (1,500 kg per year)
- eliminated the generation and subsequent recycling of metal waste (400 kg per year)
- resulted in an approximate cost avoidance/improved operational efficiency of \$120,000 per year.

This source reduction initiative had a one-time implementation cost of approximately \$409,000. This new machine recycles the water used within the system as well as completely eliminating air pollutants and the noise. The water jet cutter can cut thicker metal pieces and is significantly more precise. (See example plaque.) This provides more operational flexibility and eliminates the need for additional machining once the initial cutting is complete. Implementation resulted in an annual cost avoidance of approximately \$120,000.



Water Jet Cutter Technology

Imaging Plate System Implementation

Eliminates Photographic Chemicals

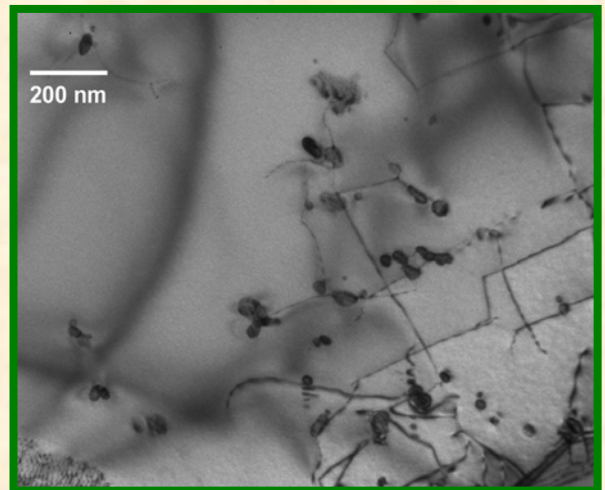
Electron microscope images historically had been recorded using a wet chemistry photographic process within the Metals and Ceramics (M&C) Division in Building 5500. This process required developer, stop bath, fixer, and water to process the film and selected negative images on photographic paper. This fiscal year 2004 initiative replaced the traditional wet chemistry photographic process with an imaging plate system. This implementation eliminated personnel exposure to the photographic chemicals and the waste from the traditional wet chemistry process.



This source reduction initiative had a one-time implementation cost of approximately \$115,000. It provided digital images directly and increased the speed and efficiency of the process while eliminating the potential for hazardous waste or water-related regulatory issues. Implementation resulted in an annual cost avoidance of approximately \$25,000 per year. This cost avoidance did not include reduced operational costs due to increased efficiency.

Consequently, this source reduction initiative:

- eliminated the purchase and use of film and photographic paper
- eliminated the purchase, use, and resulting waste generation of photographic chemicals, approximately 96 kilograms per year
- eliminated the use of approximately 1,000,000 gallons per year of once-through process water (4,000,000 kilograms) and the need for silver recovery of the fixer
- eliminated an estimated annual cost of approximately \$25,000 per year.



Internal microstructure of a nickel-based superalloy taken with the Imaging Plate System